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Effect of media and foliar spray of primary nutrients (NPK) on growth and yield of *Anthurium* (*Anthurium andreanum*) var. Tropical under greenhouse

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ABSTRACT

The present investigation was carried out to study the effect of various growing medium and foliar spray of primary nutrients (NPK) on Anthurium (*Anthurium andreanum*) var. Tropical under fan and pad type greenhouse. Coconut husk + charcoal (3:1) as a growing media significantly improved all the vegetative and flowering parameters. Weekly once foliar application of 30:10:10 (NPK) @ 0.2 % recorded significantly maximum plant height, number of leaves, leaf petiole and plant spread. Whereas, early flower bud emergence, early unfurling of spathe and maximum stalk length, stalk diameter, spathe length, spathe width and flower yield were recorded in plants sprayed with 12:61:40 (NPK) @ 0.2 % once in a week.

Key words: Anthurium, Coconut fiber, Coconut husk, Cocopeat, Nutrients

Anthurium (*Anthurium andreanum*) is an evergreen herbaceous perennial of the tropics and belongs to family Araceae. It is one of the most commercialized cut flowers in the world and comes under top ten flowers in the global flower trade which commands a respectable price both for cut flower and pot plant. It consists of a typical cup shaped inflorescence and contains numerous flowers closely arranges in a spadix together with an outer colourful heart shaped sheath called spathe.

Because of their spectacular blooms, elegance, variety of bright colours, long vase life and durability on plant, attract a majority of growers.

Anthurium is an epiphytic plant; therefore media and nutrient management play an important role in its successful cultivation. It requires a well aerated medium with good water retention. However, the secret of success for commercial cultivation of *Anthurium* is to have good drainage in the medium used. Application of optimum dose of nutrients at right time is also very important to get better quality and quantity of flowers. However, the research on media and nutrients is scanty, henceforth present research on effect of different growing medium and primary nutrients on vegetative and floral growth of *Anthurium* var. Tropical was envisaged.

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MATERIALS AND METHODS

The experiment was conducted at Greenhouse Complex, Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari which comes under south Gujarat Heavy Rainfall Zone-I, AES-III. Navsari is situated at 20° - 95' North latitude and 75°- 95' East longitude at an altitude of 10 meters above mean sea level. The experimental site is located 12 km away in the east from Arabian seashore, the historical place Dandi. The experiment was laid out in split plot design, having five main plots by using different growing mediums, viz. cocopeat (M_1), cocopeat + perlite + vermiculite (8:1:1) (M_2), coconut fiber (M_3), coconut husk (M_4) and coconut husk + charcoal (3:1) (M_5) and five sub plots having different combinations of weekly once foliar application of NPK, viz. 30:10:10 (F_1), 12:61:40 (F_2), 13:40:13 (F_3), 19:19:19 (F_4) and 16:8:24 (F_5) @ 0.2% with the objective to study the effect of different media and foliar spray of primary nutrients on flowering and yield of *Anthurium* var. Tropical. Foliar application of primary nutrients by making of 30:10:10 (N:P:K) using 2.27g of urea, 0.87g of DAP and 0.8g of sulphate of potash diluted in one liter of RO water. Similarly, all other combinations were made and sprayed to the plants. Surfactant was also added as wetting agent before spray on plants. Other readymade graded fertilizers (19:19:19, 13:40:13, 12:61:40 NPK) were purchased from market. Six months old tissue cultured plants of *Anthurium* variety Tropical were planted under fan and pad type greenhouse. The beds (plastic troughs) consist of plastic foil (0.1cm thick) with a drainage holes for removing excess water at the each sides having 1.20 m width and 10 m length was used for plantation and media

was also filled in these beds as per treatment. Path width of 0.5 meter was maintained. The bottom of the bed was sloped from the side the middle of the bed (2-3 cm), so that the drain water flows to the drainage hose. Small concretes were also spread under the greenhouse before installation of trough beds. Uniform cultural practices were followed throughout the experiment. The data were recorded on vegetative growth parameters, viz. plant height, number of leaves, leaf petiole length, plant spread and flowering parameters, viz. days taken to flower bud initiation, days taken to spathe unfurling, stalk length, diameter of stalk, spathe length, spathe width and yield of flowers.

Only pooled data of two years (2013-14 and 2014-15) are presented in tables for growth, flowering and yield parameters (except days to flower bud appearance and days to spathe unfurling) which were analysed in split plot design as suggested by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

The pooled data of two years regarding the different vegetative growth parameters of *Anthurium* var. Tropical as influenced by growing media and nutrients are presented in Table 1. Among different combinations of growing medium studied, plants grown in coconut husk + charcoal recorded significantly maximum plant height (38.90 cm), number of leaves (6.66), length of leaf petiole (21.30 cm) and plant spread (29.32 cm). Highly organic, well aerated media with good water retention capacity and drainage is needed in *Anthurium* because of it's epiphytic nature (Muraleedharan and Karuppaiah 2015). Coconut husk + charcoal media provides sufficient anchorage or support to the plant, serves as reservoir for optimum moisture and aeration which allows gaseous exchange between the roots and atmosphere outside the root substrate. Moreover, charcoal absorbs dissolvable salts and other impurities that could damage the root systems of the plant and allows free air movement, retains moisture and nutrients for growth of plants and delays senescence of the leaves present on the plant when used in combination with other growing media (Santiago and Santiago 1989).

Table 1 Effect of media and primary nutrients on vegetative growth of *Anthurium* var. Tropical (pooled data over two years)

Treatment	Plant height (cm)	Number of leaves	Leaf petiole length (cm)	Plant spread (cm)
Media				
M_1	31.11	4.69	17.71	21.68
M_2	32.87	5.01	18.57	23.65
M_3	34.65	6.12	18.82	22.92
M_4	36.39	6.41	20.34	24.98
M_5	38.90	6.66	21.30	29.32
CD (P=0.05)	1.36	1.68	3.01	2.71
CV (%)	10.07	7.06	10.85	12.66
Nutrient				
F_1	39.36	7.23	22.33	27.19
F_2	31.50	5.05	17.57	22.39
F_3	31.66	4.89	17.21	22.37
F_4	34.41	5.48	19.16	24.54
F_5	36.99	6.24	20.47	26.06
CD (P=0.05)	0.67	1.14	1.48	1.31
CV (%)	8.33	6.26	5.37	7.49

In case of application of nutrients, plants sprayed with 30:10:10 NPK @ 0.2% once in week attained significantly maximum height (39.36 cm), number of leaves (7.23), leaf petiole length (22.33 cm) and plant spread (27.19 cm). Increase in all vegetative parameters could be attributed to optimum dose of nitrogen received by the plants that increased synthesis of proteins and consequence of which there is an increased meristematic activity leading to higher plant growth (Arney 1950, Salvi 1997, Srinivasa and Reddy 2005, Valsalakumari *et al.* 2001). Nitrogen is the major constituent of chlorophyll and involved in major physiological process like photosynthesis (Baboo and Singh 2006).

It is clear from Table 2 that early flower initiation (106.37 days), spathe unfurling (13.51 days), maximum flower stalk length (35.05 cm), stalk diameter (4.05 mm), spathe length (9.43 cm) and width (7.22 cm) and number of flowers/plant (6.91) were noted in plants grown in coconut husk + charcoal. *Anthurium* is epiphytic in nature with creeping, climbing or arborescent stems including lots of aerial roots that aid in taping water and nourishment, whereas coconut husk + charcoal media provide favuorable conditions like aeration and drainage to the plant growth. Good flower production usually depends upon various factors including the type of growing media used in *Anthurium*. Early flowering in *Dendrobium* with coconut fiber was also reported by Cibes *et al.* (1957) and Arumugam and Jawaharlal (2004). Muraleedharan and Karuppaiah (2015) also found that the coir pith + coconut husk was best media with respect to flowering in *Anthurium*. The early flowering was probably due to increased availability of nutrients during the vegetative (juvenile) phase, which increased photosynthesis and respiration with enhanced carbon-di-oxide fixation, thereby induced early flowering. Similar results were recorded in sand + coir pith media by Basheer and Thekkeyam (2012) and in sand + coconut husk medium by Hatibarua *et al.* (2003) in *Anthurium*.

It is explicit from the data (Table 2) that foliar application of primary nutrients, viz. 12:61:40 (NPK) @ 0.2 % weekly once drastically reduced the number of days taken for flower bud initiation (123.89), spathe unfurling (14.89 days) along with maximum flower stalk length (31.43 cm), stalk diameter (4.00 mm), spathe length (9.23 cm), spathe width (7.42 cm) and yield of *Anthurium* flowers/plant (5.13). A good number of leaves coupled with conducive root environment which would have led to proper nutrient uptake in the organic substrates may have resulted in greater accumulation of food matter leading to increased length of stalk, spathe length and width of spathe.

Table 2 Effect of media and primary nutrients on flowering and yield of *Anthurium* var. Tropical (pooled data over two years)

Treatment	*Days to flower bud appearance	*Days to spathe unfurling	Stalk length (cm)	Stalk diameter (mm)	Spathe length (cm)	Spathe width (cm)	Flowers /plant / year
Media							
M_1	180.95	17.65	18.14	2.72	6.77	5.84	2.30
M_2	160.47	17.49	22.27	3.01	7.77	6.38	2.50
M_3	135.85	15.88	31.53	3.69	9.17	6.67	3.91
M_4	108.05	15.75	34.63	3.81	8.13	6.96	5.80
M_5	106.37	13.51	35.05	4.05	9.43	7.22	6.91
CD (P=0.05)	11.09	0.86	2.35	0.14	0.50	0.90	2.79
CV (%)	9.53	6.39	7.70	7.41	9.64	8.26	10.62
Nutrient							
F_1	144.65	16.89	26.29	3.07	8.20	6.32	3.28
F_2	123.89	14.89	31.43	4.00	9.23	7.42	5.13
F_3	149.64	16.87	25.50	3.09	7.65	5.96	3.73
F_4	140.05	16.27	28.22	3.38	7.45	6.44	4.27
F_5	133.45	15.36	30.18	3.74	8.74	6.95	5.00
CD (P=0.05)	9.02	0.92	2.87	0.18	0.58	0.154	0.42
CV (%)	8.84	7.83	6.76	9.09	7.52	6.39	9.70

*Observations were recorded one time only at the beginning of the experiment.

Optimum levels of balanced NPK nutrition as it enhances better photosynthetic activity and production of carbohydrates, which helps in better partitioning of nutrients from source to sink (Srinivasa and Reddy 2005, Jawaharlal *et al.* 2001, Higaki *et al.* 1992) in *Anthurium*. Application of high phosphorous used prior and during the development of the inflorescence gave the best flowering in Phalenopsis (Gordon 1990). These results may be related to the increase of the available nutrients which led to increase in number of flowers (Parthiban and Khader 1991) in *Polianthes tuberosa*. Potassium efficiency in plants is directly linked to root growth, flowering and morphology, nutrient uptake efficiency, translocation and utilization efficiency (Fageria *et al.* 2007).

Spray of 12:61:40 NPK @ 0.2% gave good quality flowers along with higher yield. Probable reason of this is phosphorus which is a main constituent of chlorophyll and is involved in many physiological processes including cell division, development of meristematic tissue, photosynthesis, metabolism of carbohydrates, fats and proteins for synthesis of nucleic acids and main role in stimulation of roots. Potassium which is necessary for nitrogen assimilation into protein and major osmotically active component in the plant cells contributing to cell turgor and enhances the capacity of plant cell to retain water and nutrients, in this function K^+ seems to be particularly important in young tissue. The tugor in the young leaves has direct effect on the cell size and growth rate of entire plant. Activating apical meristems beside the protoplasm formation, it plays important role in division and elongation of meristem cells, enhancing the biosynthesis of proteins as well as carbohydrates.

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